PATENT SPECIFICATION (11) 1 297 746

DRAWINGS ATTACHED

1 297 746

(21) Application No. 12889/71 (22) Filed 4 May 1971
(31) Convention Application No. 34 179 (32) Filed 4 May 1970 in
(33) United States of America (US)
(45) Complete Specification published 29 Nov. 1972
(51) International Classification A61M 25/00
(52) Index at acceptance
A5R 33C4 43 45

(54) IMPROVEMENTS IN OR RELATING TO INJECTION APPARATUS

(71) I, WILLIAM XAVIER HALLORAN, Citizen of the United States of America, of 440 Fair Drive, Costa Mesa, State of California 92626, United States of America,

do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:

The invention relates to medical injection devices for injecting medicine into the veins or muscles of a patient.

Catheter injection devices have been proposed which include plastic catheters telescoped within metal needles for projection out of the end of the needle once the needle has been inserted in a patient's vein. A device of this type is disclosed in the specification of United States Patent No. 3,000,380. However, injection devices do not appear to be known which incorporate a sheath or sleeve telescoped over the needle and connected with a pusher extending rearwardly along the needle to a point adjacent the coupling means whereby the needle may be coupled with a container of medicine, the point inserted through the wall of a patient's vein and extended axially down such vein and the pusher extended to telescope the sleeve into protective position over the point of the needle to protect the vein wall from puncture.

According to the invention, there is provided an injection apparatus comprising a hollow needle formed at one end with a point and including a longitudinal passage formed in the wall thereof; coupling means connected with the end of the needle opposite the end formed with the point; a protective sleeve telescoped over the first-mentioned end of the needle; and a pusher connected at one end thereof with the sleeve and extending rearwardly through the passage to form a finger-grasp portion spaced rearwardly of the first-mentioned end of the needle whereby the sleeve may be retracted on the needle to expose the point.

In a particular embodiment of the invention, the apparatus just described includes a projection extending transversely of the needle to form a lever arm adapted to be secured to the patient's body to prevent rotation of the needle.

The coupling means may include a manifold formed with a plurality of ports each adapted for connection with a container for a material to be injected.

Embodiments of the invention will now be described by way of example with reference to the accompanying drawings in which:—

Figure 1 is a perspective view of an injection apparatus embodying the present invention;

Figure 2 is a perspective view of a second embodiment of the injection apparatus of the present invention;

Figure 3 is a perspective view, in reduced scale, of the injection apparatus shown in Figure 2 inserted in a patient;

Figure 4 is a partial perspective view, in enlarged scale, of the injection apparatus shown in Figure 1;

Figures 5 and 6 are vertical sectional views taken along the lines 5-5 of Figure 4; Figure 5 showing the protective sleeve in its retracted position, and Figure 6 illustrating this injection apparatus with the sleeve in the extended position;

Figure 7 is a vertical sectional view, in enlarged scale, taken along the lines 7-7 of Figure 6;

Figure 8 is a vertical sectional view taken longitudinally through a vein and showing insertion of the injection apparatus shown in Figure 1;

Figure 9 is a vertical sectional view in enlarged scale, of part of the injection apparatus shown in Figures 5 and 6;

[Price 25p]

Figure 10 is a horizontal sectional view taken along the lines 10-10 of Figure 9;

Figure 11 is a perspective view of a modification of the injection apparatus shown in Figure 2;

Figure 12 is a longitudinal sectional view, in enlarged scale, taken along the lines 12-12 of Figure 11;

Figure 13 is a cross-sectional view of part of a further embodiment of the injection apparatus of the present invention.

Referring to Figure 1, the injection apparatus shown comprises a pointed needle 31 having a coupling 35 on its rear extremity for connection with a syringe 37. As shown in Figures 4 and 5, a protective plastics sleeve, generally designated 41, is telescoped over the pointed end of the needle 31 and has the front end of a pusher wire 43 connected therewith, the rear extremity of the pusher wire 43 being connected with a finger-grasp annular plunger 45. Thus, the sleeve 41 may be drawn back on the needle as shown in Figure 5 and the needle pierced through the wall of a patient's vein 47 (Figure 8) and extended axially down such vein. The plunger 45 may then be grasped and pushed axially down the needle 31 to telescope the sleeve 41 forwardly over the end of such needle to protect the wall of the vein 47 from being pierced thereby.

The needle 31 may be made of any medically accepted material, but is preferably of a nickel alloy metal which enjoys a reputation for low infection rate. Referring to Figure 5, the needle is bevelled on its free extremity to form a bevel point 51 and is connected at its rear extremity to a rearwardly opening coupling cap 35 which is removably received on a forwardly projecting nipple formed at the front extremity of the syringe 37.

Referring to Figures 6 and 7, the needle 31 is formed in its wall with a longitudinally extending bore 57 which is open on one side. The bore 57 extends from the rear of the needle and forwardly to terminate at an abutment stop 59 behind the point 51 whereby such abutment stop will be abutted by the forward extremity of the pusher wire 43 to thereby limit forward movemetn of the sleeve 41 on the needle 31. pusher wire 43 may be made of metal, plastics or any medically accepted material which will provide sufficient rigidity when housed in the bore 57 to enable the sleeve 41 to be pushed forwardly.

Referring to Figures 9 and 10, the pusher wire 43 includes a plurality of spaced apart cross bars 61 at its forward extremity, the opposite extremities of such cross bars 61 being imbedded in the plastics sleeve 41 to provide secure coupling therewith.

In operation, the injector apparatus as shown in FIG. 1 is connected with a syringe 37 and the sleeve 41 retracted on the needle 31 to expose the metallic point 51 as shown in FIG. 5. The point 51 may then be pierced through the wall of the vein 47 (FIG. 8) and extended axially down such vein. The annular plunger 45 may then be pushed downwardly to slide the sleeve 41 outwardly over the tip 51 to protect the wall of the vein from puncture by such tip. Fluid may then be injected from the syringe 37 and if additional medicinal fluids are required, such syringe may be disconnected from the coupling 35 and a conduit from a container of other fluid medicine connected therewith to commence infusion of such fluid intravenously. With the protective sleeve 41 projected over the point 51 to protect the wall of the contracting vein from the sharp point 51, such needle may be left in the vein for long periods of time without danger of puncturing the vein and requiring additional venipunctures. Further, the sleeve 41 projects over the bevel of the point 51 to prevent the wall of such vein from constricting thereagainst to block blood flow therethrough when the apparatus is used for withdrawal of blood. It is of particular importance that the needle 31 is made of metal and the sleeve 41 is of relatively flexible plastics material because, in many hospitals, nurses, other than surgical nurses, are not permitted under hospital rules to make intraveneous injections with anything but a metal needle. With the inpection apparatus of the present invention many qualified personnel that could not otherwise give injections under the rules of many hospitals may do so. Since veins are generally oval in cross section the needle 31 may be oval in cross section to readily accommodate the vein shape.

Obviously, the injection apparatus of the present invention can be utilized for injecting fluid medicine in muscles and the sleeve 41 may be projected to cover the point 51 from piercing an artery or nerve while the medicine is being injected.

Referring to FIGS. 2 and 17, a manifold type catheter injection device, generally designated 65, is provided with a needle 31 which is connected on its rear extremity with a manifold assembly, generally designated 67, by means of elongated flexible conduits 71 and 71', respectively. The flexible conduit 71 is made of flexible plastics material while the conduit 71' is a flexible metal conduit.

The manifold assembly 67 is formed with three rearwardly projecting bosses 73, 75 and 79. Referring to FIG. 12, each of such bosses is formed with an internally tapered connecting bore 83 for receipt of a connecting nipple of a syringe or connector from a container of other medicinal fluid. Plugs 85

are provided for the respectively tapered bores 83 whereby bosses 73 75 or 79 when not in use may be closed.

The manifold catheter 65 is utilized in a manner similar to the injection apparatus shown in FIG. 1 except thta the entire tube 71 or 71' may be inserted axially in the vein for disposing the needle tip a substantial distance from the point of puncture. Further, the manifold 65 may be strapped securely in position by a strip 89 of self-connecting material such as that sold under the name Velcro (Registered Trade Mark) to cause the manifold to act as a lever arm to positively prevent rotation of the manifold catheter 67 with respect to the vein 47 to thereby prevent the bevelled tip 51 from rotating within such a vein and cutting the wall thereof. Obviously, the Velcro strip 89 overcomes the normal objections to repetitive use of tape on persons sensitive thereto and may, itself, be reused. One or more tubes 91, 93 and 95 may be connected with the respective bosses 73, 75 and 79 for selective introduction of medicinal fluid to be infused intraveneously. This is of particular importance where a patient may require a number of intraveneous injections and personnel are unavailable for making the venipunctures. Once the venipucture is made, any hospital personnel may connect the tubes 91, 93 and 95 and control fluid flow thereto.

The injector apparatus shown in FIG. 13 includes a metallic needle, generally designated 131, which is formed on its extremity with a reduced-in-exterior-diameter cross section 133 that defines a shoulder 135 on its rearward end. Telescoped over the reduced-in-diameter section 133 is a tapered protective sleeve 139 which is coupled with an annular plunger (not shown) by means of a pusher rod 141. The sleeve 139 includes an inwardly projecting tab 143 which travels axially in an axial slot 145 formed in the wall of the needle 131 and terminating at its forward extremity in a shoulder 147 whereby telescoping of the sleeve 139 off the end of the needle 131 is prevented. The injection apparatus shown in FIG. 13 operates substantially the same as that for the apparatus shown in FIG. 1 except that the tapered protective sleeve 139 is substantially the same diameter at its rear extremity as the needle 131.

From the foregoing detailed description it will be apparent that the injection apparatus of the present invention provides convenient means for making intraveneous injections or injecting medicinal fluids or withdrawing blood. The protective sleeve protects the wall of the contracting vein from the point of a bevelled needle and serves to maintain the contracting wall spaced from the bevel of such needle thereby preventing blocking thereof and preventing withdrawal of blood. Additionally, the use of a metallic needle enables nurses and other hospital personnel, less highly qualified than surgeons and surgical nurses, to perform the venipuctures thereby enabling the venipuncture to be performed as soon as the necessity of such is diagnosed to eliminate the necessity of waiting for arrival of more highly trained persons who may not be present when the requirement for a venipuncture is first diagnosed. Further, the manifold arrangement enables injection of a plurality of different medicinal fluids simultaneously or consecutively without the necessity of making additional venipunctures.

WHAT I CLAIM IS:—

1. An injection apparatus comprising a hollow needle formed at one end with a point and including a longitudinal passage formed in the wall thereof; coupling means connected with the end of the needle opposite the end formed with the point; a protective sleeve telescoped over the first-mentioned end of the needle; and a pusher connected at one end thereof with the sleeve and extending rearwardly through the passage to form a finger-grasp portion spaced rearwardly of the first-mentioned end of the needle whereby the sleeve may be retracted on the needle to expose the point.

2. An apparatus as claimed in claim 1 wherein the needle is made of metal and the sleeve is made of plastics material.

3. An apparatus as claimed in claim 1 or claim 2, wherein the needle includes an abutment for engaging the sleeve to limit telescoping of the sleeve off the said first-mentioned end of the needle.

4. An apparatus as claimed in any preceding claim which includes a projection extending transversely of the needle to form a lever arm adapted to be secured to the patient's body to prevent rotation of the needle.

5. An apparatus as claimed in any preceding claim wherein the said coupling means includes a manifold formed with a plurality of ports each adapted for connection with a container for a material to be injected.

6. An apparatus as claimed in any preceding claim which includes a flexible conduit interconnecting the needle and the said coupling means.

7. An apparatus as claimed in claim 1 wherein the needle is formed on its extremity remote from its connection with the said coupling means with a reduced-in-exterior-diameter-cross section portion and the interior cross section of said sleeve is formed to complement the cross section of the aforesaid reduced-in-exterior-diameter-

cross section portion for telescopical receipt thereover.

8. An injection apparatus as claimed in claim 1 substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

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Chartered Patent Agents.

Printed for Her Majesty's Stationery Office by The Tweeddale Press Ltd., Berwick-upon-Tweed, 1972.
Published at the Patent Office, 25 Southampton Buildings, London WC2A 1AY from which copies may be obtained.

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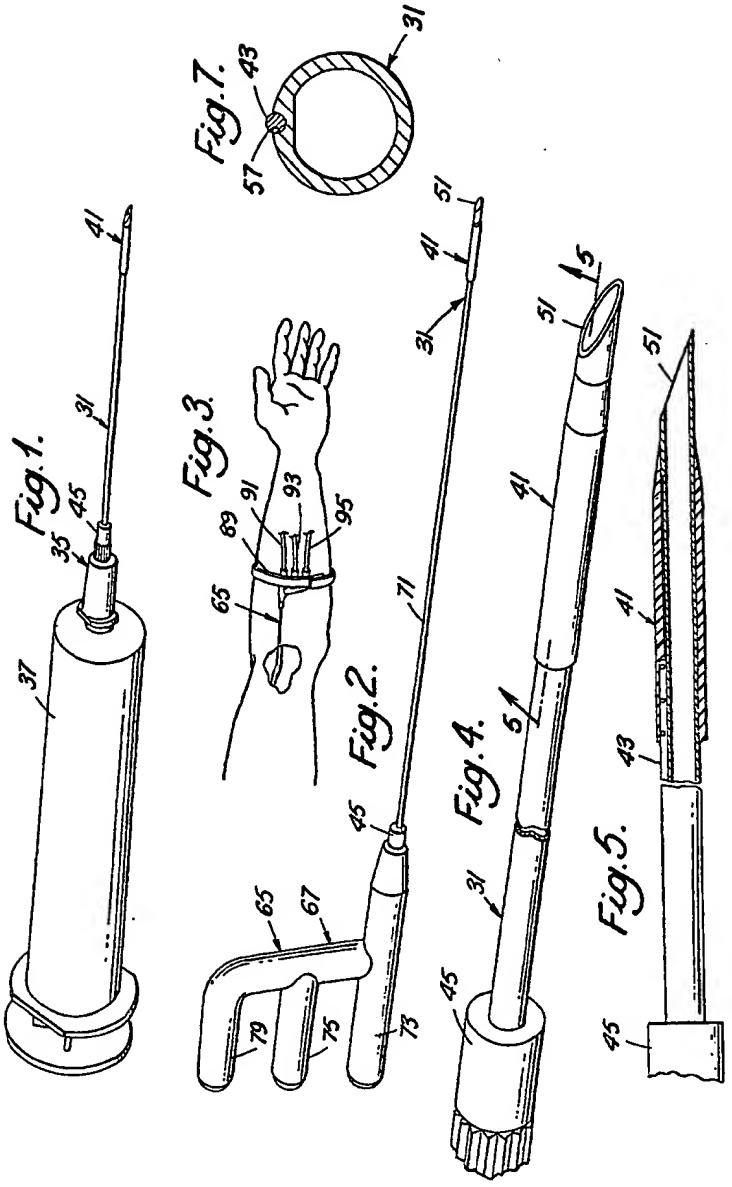
2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 1



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